



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 326 039
A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 89100997.9

(51) Int. Cl. 4: G09F 3/02 , G09F 3/10

(22) Date of filing: 20.01.89

(30) Priority: 20.01.88 JP 6629/88 U

(71) Applicant: FUJI SEAL INDUSTRY CO. LTD.
5-3-18, Imazukita Tsurumi-ku
Osaka(JP)

(43) Date of publication of application:
02.08.89 Bulletin 89/31

(72) Inventor: Taki, Junji
1-1132-17, Shikishima-cho
Nara-shi(JP)

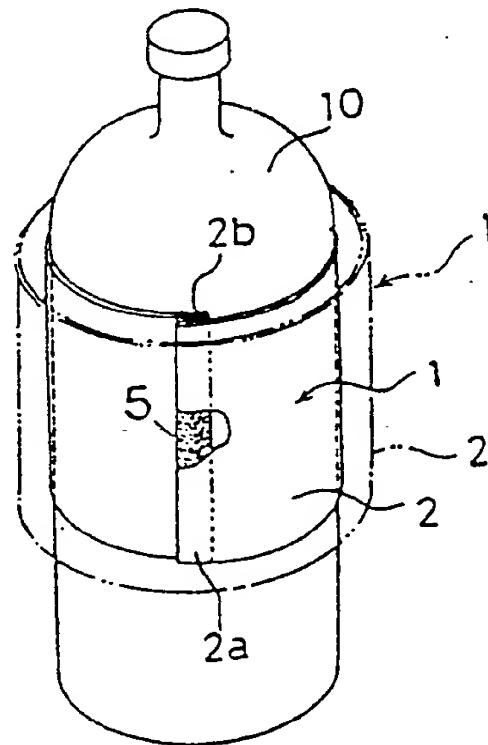
(84) Designated Contracting States:
DE FR GB IT

(74) Representative: Dr. Elisabeth Jung Dr. Jürgen
Schirdewahn Dipl.-Ing. Claus Gernhardt
P.O. Box 40 14 68 Clemensstrasse 30
D-8000 München 40(DE)

(54) Releasable tubular label.

(57) A generally tubular label (1) adapted to be fitted around an article of manufacture such as a bottle, which label comprises a sheet-like label blank (2) having a pair of portions (2a, 2b) opposite to each other and a hot-water or base soluble adhesive layer (4) connecting the opposite portions of the label blank together. The hot-water soluble adhesive layer is soluble in contact with a hot water of a temperature not lower than about 50 °C. The base soluble adhesive layer is soluble in contact with an base solution of either ambient temperature or elevated temperature.

FIG 8



EP 0 326 039 A1

Releasable Tubular Label**BACKGROUND OF THE INVENTION****(Field of the Invention)**

The present invention generally relates to a generally tubular label adapted to be applied around a generally tubular article of manufacture such as a bottle or the like container and, more particularly, to the generally tubular label of a type having a pair of portions opposite to each other and connected together while a portion substantially intermediate of those portions is turned around the tubular article.

(Description of the Prior Art)

Beverages are nowadays available in the market as filled in a variety of containers including glass bottles, plastic bottles, carton boxes and metallic cans. Of those containers, glass bottles and most of the plastic bottles can be reused after the contents have been consumed. In order for those bottles to be reused, some manufacturers have made it a routine job to recover used bottles from the market and cleanse them before beverages are again filled in the recovered and cleansed bottles. The bottles which can be reused are generally rigid and tough enough to withstand repeated use thereof and generally have a simple and regular shape.

It is well known that the beverage containers such as glass or plastic bottles available in the market are applied with product identifying labels which may concurrently serve as a protective covering for preventing the containers from being scratched, scribed, rubbed or damaged in any way whatsoever. Although the product identifying labels are available in a variety of designs, some of them are of a type having a pair of edges or ends opposite to each other and applied to the bottle with its edges or ends connected together while a portion thereof substantially intermediate of the edges or ends is turned around the bottle.

The tubular product identifying label of the type referred to above and adapted to be turned around, for example, the bottle is generally prepared by cutting a web of sheet material such as plastic film, paper or the like into a generally rectangular label blank of predetermined dimensions, the opposite ends of such label blank being subsequently bonded together by the use of a heat-fusion technique or by the use of adhesive material thereby to complete the tubular product identifying label. The label may be printed, or otherwise

formed in any suitable manner, with product identifying information and/or vignettes either after or prior to the completion of the tubular product identifying label. Depending on the type of material of the tubular product identifying label, the tubular product identifying label may be either mounted on the bottle and is subsequently allowed to fit around the bottle such as a 'shrinkwrap', or turned around the bottle prior to the bonding of the opposite ends thereof together.

When it comes to the reuse of the bottles, the product identifying labels on the bottles are removed prior to or during the cleansing the bottles and new product identifying labels are applied after the filling of beverages in the cleansed bottles. Hitherto, the removal of the product identifying labels from the bottles which have been recovered from the market poses a number of problems.

For the removal of the labels from the bottle, a generally practiced method is either by applying a knife edge to remove the label from the bottle, by applying a highly heated air to burn the label, or by rubbing the label in a water tank if the label is made of paper.

Considering a large number of bottles which are handled in a beverage plant, automated machinery is required for the removal of the labels from the bottles. The removal of the labels by the use of the knife edge is not easy to automate and, if successfully automated, the outcome would be a machine which is complicated in structure, expensive to make and low in efficiency. Yet, the use of the possibly successfully automated machine would be limited to the bottles made of glass because, if the bottles are made of plastics, the plastic bottles would be susceptible to damage imparted by the knife edge during the cutting of the labels. Even where the bottles are made of glass, a similar description applies, provided that the bottles are lined with a resinous protective coating used to prevent the bottles from being scratched, scribed, rubbed or damaged which would occur when the bottles are brought into contact with each other during transportation regardless of the presence or absence of the labels.

The second mentioned technique, that is, the burning of the labels to remove them from the bottles, appears to be more efficient than the use of the knife edge and can be easily embodied in an automatic machine. However, this technique cannot be employed with the bottles made of plastics, or the bottle made of glass and coated exteriorly with the resinous protective lining, because the plastic bottles or the resinous protective lining would be thermally deformed or otherwise damaged.

SUMMARY OF THE INVENTION

The present invention has been devised with a view to providing a generally tubular label which can be easily and efficiently removed from the article of manufacture such as, for example, bottle made of either glass or plastics without substantially giving damage to the article of manufacture during the removal of the label.

In order to accomplish the above described object, according to one aspect of the present invention, the generally tubular label comprises a sheet-like label blank having a pair of portions opposite to each other and a hot-water soluble adhesive layer connecting the opposite portions of the label blank together, said hot-water soluble adhesive layer being soluble in contact with heated water of a temperature not lower than about 50 °C, preferably 50 ° to 70 °C.

In a preferred embodiment of the present invention, the hot-water soluble adhesive layer may comprise a hot-water soluble adhesive material applied to one of the opposite portions of the label blank so that the other of the opposite portions of the label blank can be connected with such one of the opposite portions thereof through the adhesive material to complete a joint between the opposite portions.

Alternatively, the hot-water soluble adhesive layer may comprise a length of hot-water soluble tape bonded to the opposite portions of the label blank with the use of any suitable bonding agent to complete a joint between the opposite portions.

According to another aspect of the present invention, the generally tubular label comprises a sheet-like label blank having a pair of portions opposite to each other and a base-soluble adhesive layer connecting the opposite portions of the label blank together, said base-soluble adhesive layer being soluble in contact with an inorganic or organic base in liquid or vapor form or a solution, suitably an aqueous solution of an inorganic or organic base, either heated or at ambient temperature. It is preferred that the base by one which, upon contact with water, delivers a pH greater than 7.5. However, where the article of manufacture around which the tubular label of the present invention is fitted according to the present invention is apt to be damaged in contact with a strong base solution, the solution should have a pH value not exceeding 10.

In any event, any readily available inorganic bases include ammonia, aqueous ammonia and aqueous solutions of hydroxides or carbonates of alkali metal or alkaline earth metal, for example, sodium hydroxide, potassium hydroxide, sodium carbonate and the like. On the other hand, any readily available organic bases include, for exam-

ple, primary amines, secondary amines, and tertiary amines, which may be aliphatic, alicyclic, aromatic, heterocyclic, or combination thereof. This list is in no way intended to be limiting but rather illustrative of the wide range of bases which may be employed for the purpose of the present invention.

In a preferred embodiment of the present invention, the base-soluble adhesive layer may comprise an base-soluble adhesive material applied to one of the opposite portions of the label blank so that the other of the opposite portions of the label blank can be connected with such one of the opposite portions thereof through the adhesive material to complete a joint between the opposite portions.

Again alternatively, the base-soluble adhesive layer may comprise a length of base-soluble tape bonded to the opposite portions of the label blank with the use of any suitable bonding agent to complete a joint between the opposite portions.

According to the present invention, because of the unique adhesive layer, the label applied to the bottle which has been recovered for the purpose of reuse thereof can readily be removed from the bottle only by causing the labeled bottle to contact the heated water or the base solution. The contact of the labeled bottle with the heated water or the base solution may be carried out either by immersing the labeled bottle in a bath containing the heated water or the base solution, or by spraying the heated water or the base solution to the labeled bottle. Upon contact of the label on the bottle with the heated water or the base solution, the unique adhesive layer is dissolved to permit the label to release naturally from the bottle.

In a beverage plant, the method of the present invention can be embodied by transporting, by the use of a conveyor, at least one row of recovered bottles a label removing station where a bath of heated water or base solution is installed or where a number of spray nozzles are installed for spraying the heated water or the base solution. Therefore, the equipments required to accomplish this should be simple in structure and inexpensive to make.

When forming the joint between the opposite portions, of the label blank, the opposite portions of the label blank may be connected together by means of the unique adhesive layer according to the present invention in either a butt-weld fashion, wherein the opposite portions of the label blank adjoin with each other with or without a gap formed therebetween, or a lap-weld fashion wherein the opposite portions of the label blank overlap with each other. In particular, where the butt-weld fashion is employed with a gap existing between the opposite portions of the label blank, the use of the

unique adhesive layer in the form of the hot-water or base soluble tape is recommended to cover up the gap.

Where the hot-water soluble adhesive layer is employed to connect the opposite portions of the label blank to complete the generally tubular label, the temperature the heated water at which the hot-water soluble adhesive layer can dissolve should be not lower than 50° because of the following reason. In general, so long as the beverage bottles are distributed and circulated in the consumer market, it is not unusual for those bottles to be brought into contact with water. For example, the bottles may be wet or be damped in the rain and/or in a household kitchen. As far as the household kitchen is concerned, hot water is occasionally used to wash tableware and it may occur that the labeled bottle may be washed as well with hot water. If the tubular label applied around the bottle has its opposite portions connected together with the usual adhesive material soluble at a temperature lower than about 50°, the label may separate from the bottle with the adhesive material dissolved by either the rain water or the cleansing water in the household kitchen. The hot water available from a kitchen faucet is generally of a high of a temperature comparable to the human body temperature and not higher than about 35° and, therefore, the use of the adhesive material soluble at this low temperature should be avoided in the practice of the present invention in order for a higher percentage of bottles to be recovered from the market for reuse without having been damaged.

Therefore, the use of the hot-water soluble adhesive layer soluble at the specific temperature not lower than about 50° is desirable. Where the bottle is made of plastics, the unique hot-water soluble adhesive layer used in the practice of the present invention must have an upper limit temperature dependent on the temperature which the plastics can withstand. In general, most of the beverage containers made of plastics can exhibit a heat resistance up to 80° to 140°C.

When it comes to the base soluble adhesive layer, the base solution used to dissolve it may be either of an ambient temperature or of an elevated temperature, although the use of the base soluble adhesive layer soluble at the elevated temperature is most preferred by a reason similar to that discussed above in connection with the hot-water soluble adhesive layer.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more clearly understood from the following description of preferred embodiments thereof taken in conjunction

with the accompanying drawings which are given only for the purpose of illustration and explanation and in which:

5 Figs. 1 is a schematic perspective view, with a portion cut away, of a generally tubular label according to a preferred embodiment of the present invention in which a soluble adhesive tape is employed;

10 Figs. 2 and 3 are views similar to Fig. 1, showing the use of the soluble adhesive tape in conjunction with different types of joint between opposite ends of a label blank;

15 Figs. 4 to 7 are schematic perspective views, with a portion cut away, of the tubular label according to different embodiments of the present invention, respectively, in which a deposit of soluble adhesive material is employed;

20 Figs. 8 is a schematic perspective view of a bottle provided with the tubular label having its opposite ends connected together by means of the deposit of soluble adhesive material; and

25 Figs. 9 is a schematic perspective view of the bottle showing the manner in which the tubular label applied to the bottle shown in Fig. 8 is separated from the bottle.

DETAILED DESCRIPTION OF THE EMBODIMENTS

30 In describing the preferred embodiments of the present invention with reference to the accompanying drawings, like parts are designated by like reference numerals throughout the several view thereof.

35 Referring first to Fig. 1, a tubular label generally identified by 1 comprises a generally rectangular label blank 2 made of any known film of plastics which may be either thermally shrinkable or stretchable. The thermally shrinkable plastic film is the one which undergoes shrinkage when heated in contact with water or air of elevated temperature whereas the stretchable plastic film is the one having an elasticity. The rectangular label blank 2 has its opposite ends 2a and 2b connected together by means of a length of adhesive tape 3 to render the label blank to represent a generally tubular shape as shown.

40 50 55 In the embodiment of Fig. 1, the opposite ends 2a and 2b of the label blank 2 is butted together while the length of adhesive tape 3 preferably equal in length to the length of the tubular label 1 is applied over the resultant end-to-end joint so as to bridge therebetween. This length of adhesive tape 3 is secured to the opposite ends 2a and 2b by means of a deposit of any suitable bonding material 4.

In accordance with the present invention, the length of adhesive tape 3 is of a type capable of being dissolved in contact with a hot-water of a temperature not lower than 50°C. Where the bottle around which the tubular label 1 is fitted is made of plastics, the length of adhesive tape 3 is preferred to be of a type capable of being dissolved in contact with the hot water of a temperature within of 50° to 70°C by the reason which has been discussed previously.

The length of adhesive tape 3 referred to above is made of polyvinyl alcohol resins, examples of which include "K. Kuraray POVAL Film" (manufactured and sold by Kabushiki Kaisha Kuraray), "AICELLO VINYLON Film" and "SOLUBLON" (both manufactured and sold by AICELLO Chemical Co., Ltd.) and "BOVLON" (manufactured and sold by Nippon Gosey Co., Ltd.).

Alternatively, the length of adhesive tape 3 may be of a type capable of being dissolved in contact with an base solution. The base soluble adhesive tape 3 may be available in two types; one being of a type soluble in contact with the base solution of normal or ambient temperature and the other being of a type soluble in contact with the heated base solution. In particular, where the length of adhesive tape 3 soluble in contact with the heated base solution is advantageous in that, because the lack of one of heat and alkalis from the solution does not result in a dissolution of the length of adhesive tape 3 and, in other words, because the action of heat and the action of alkalis are simultaneously required to dissolve the length of adhesive tape 3, the length of adhesive tape can permit the label to be retained on the bottle for a relatively prolonged period of time.

The length of adhesive tape 3 soluble in contact with the base solution of ambient temperature may be made of a film of water soluble polyvinyl alcohol resin having one surface coated with an base soluble lining. The film of water soluble polyvinyl alcohol resin may be a commercially available film known as "Kuraray POVAL Film" or "SOLUBLON" and the base soluble lining applied to the water soluble polyvinyl alcohol film may be a commercially available material known as "HYDRIC GT Medium" or "WGK Medium" both manufactured and sold by Dainichiseika Color & Chemicals Mfg. Co., Ltd.

The length of adhesive tape 3 soluble in contact with the heated base solution, that is, the base solution of elevated temperature may be made of a film of hot-water soluble polyvinyl alcohol resin having one surface coated with an base soluble lining. The film of hot-water soluble polyvinyl alcohol resin may be a commercially available film known as "Kuraray Vinylon Film", "AICELLO

VINYLON Film" and "SOLUBLON" and the heated base soluble lining applied to the hot water soluble polyvinyl alcohol film may be a commercially available material known as "HYDRIC GT Medium" or "WGK Medium".

As previously described, the deposit of bonding material 4 used to secure the length of adhesive tape 3 to the opposite ends 2a and 2b of the label blank to complete the tubular label 1 may be of any known material such as generally used in the manufacture of a dry laminate, that is, a multiply sheet material.

In the embodiment shown in Fig. 1, the opposite ends 2a and 2b of the label blank 2 have been shown and described as butted together while they are connected together by the use of the length of adhesive tape 3 bonded thereto. However, the opposite ends 2a and 2b of the label blank may be overlapped one above the other and the length of adhesive tape 3 may be bonded to the outermost end 2a and a portion of the label blank adjacent the innermost end 2b as shown in Fig. 2. Again, the opposite ends 2a and 2b of the label blank 2 may be spaced a distance smaller than the width of the length of adhesive tape 3, in which case the deposit of bonding material 4 should be formed in at least two rows one on each of the opposite ends 2a and 2b of the label blank 2 as shown in Fig. 3.

In any one of the foregoing embodiments shown in Figs. 1 to 3, the use has been made of the length of adhesive tape 3 for connecting the opposite ends 2a and 2b of the label blank 2 to form the tubular label 1. However, in the embodiments which will now be described with reference to Figs. 4 to 7, respectively, no length of soluble adhesive tape is employed and, instead thereof, a deposit of soluble adhesive material is employed to connect the opposite ends 2a and 2b of the label blank together.

The deposit of soluble adhesive material 5 used in any one of the respective embodiments of Figs. 4 to 7 is identified by 5 and may be of a type soluble in contact with either the hot water of a temperature not lower than 50°C, or within the range of 50° to 70°C where the bottle is made of plastics, or the base solution of either an ambient temperature or elevated temperature.

The deposit of soluble adhesive material 5 can be formed by applying the soluble adhesive material, which is of the type soluble in contact with either the hot water or the base solution, to one of the opposite ends 2a and 2b of the label blank 2, substantially as shown in Fig. 4, where the joint therebetween is desired to be in lap weld fashion.

Alternatively, where the joint between the opposite ends 2a and 2b of the label blank 2 is desired to be in butt weld fashion, the soluble

adhesive material are to be applied in at least two rows one on each of the opposite ends 2a and 2b to form respective deposits of soluble adhesive material 5 and a length of cover-up tape identified by 6 is laid over the deposits of soluble adhesive material 5 as shown in Fig. 5. As far as this alternative of Fig. 5 is concerned, the deposit of soluble adhesive material 5 may be formed on the length of cover-up tape 6 which is subsequently applied to the opposite ends 2a and 2b of the label blank 2 to complete the tubular label 1.

The length of cover-up tape 6 having the deposit of soluble adhesive material 5 may also be employed on the overlapping opposite ends 2a and 2b of the label blank 2 to connect them together as shown in Fig. 6.

Also, with the aid of the length of cover-up tape 6, the opposite ends 2a and 2b of the label blank 2 can be connected together in a fashion similar to that shown in and described with reference to Fig. 3. More specifically, as shown in Fig. 7, the opposite ends 2a and 2b of the label blank 2 may be spaced a distance smaller than the width of the length of cover-up tape 6 and the deposit of soluble adhesive material 5 is formed in at least two rows one on each of the opposite ends 2a and 2b of the label blank 2.

The length of cover-up tape 6 used in any one of the embodiments shown in and described with reference to Figs. 5 to 7 may not be of a type soluble in contact with water or base solution.

The tubular label 1 according to the present invention is adapted to be mounted on a bottle 10 so as to encircle the body thereof as shown in Fig. 8. Where the tubular label 1 is made of thermally shrinkable plastic film, the tubular label 1 has an inner diameter greater than the outer diameter of the body of the bottle 10 as shown by the phantom line in Fig. 8 and is, after having been mounted so as to encircle the bottle body, allowed to shrink to fit around the bottle body as shown by the solid line in Fig. 8. In order to accomplish this, a blast of hot air of a temperature required for the tubular label 1 to undergo shrinkage is applied.

Alternatively, where the tubular label 1 is made of stretchable plastic film, the tubular label 1 may have an inner diameter slightly smaller than the outer diameter of the body of the bottle 10 so that the tubular label 1 can be mounted on the bottle so as to encircle the body of the bottle by radially outwardly expanding the tubular label 1 against its own elasticity by the application of an external force and then by releasing the application of the external force, after the tubular label 1 has been mounted so as to encircle the bottle body, to allow the tubular label 1 to fit to the bottle body.

Again alternatively, the tubular label 1 may be formed in situ on the bottle 6. In other words, the

tubular body 1 may be formed by turning the rectangular label blank 2 around the body of the bottle 10 and then connecting the opposite ends 2a and 2b of the label blank 2 together in the manner as hereinbefore described with reference to and shown in any one of Figs. 1 to 7.

The removal of the tubular label 1 from the bottle 10 as shown in Fig. 9 can be readily accomplished by causing the labeled bottle to contact the heated water or the base solution. As hereinbefore discussed, the contact of the labeled bottle with the heated water or the base solution may be carried out either by immersing the labeled bottle in a bath containing the heated water or the base solution, or by spraying the heated water or the base solution to the labeled bottle. The removal step during which the tubular label 1 is removed from the bottle 10 may be provided either preceding the cleansing step or in the cleansing step. Advantageously, the removal step during which the hot water or the base solution is employed may concurrently serve as the cleansing step.

Although the present invention has fully been described in connection with the preferred embodiments thereof with reference to the accompanying drawings used only for the purpose of illustration, those skilled in the art will readily conceive numerous changes and modifications within the framework of obviousness upon the reading of the specification herein presented of the present invention. Accordingly, such changes and modifications are, unless they depart from the spirit and scope of the present invention as delivered from the claims annexed hereto, to be construed as included therein.

Claims

40. 1. A generally tubular label (1) adapted to be fitted around an article of manufacture, which label comprises a sheet-like label blank (2) having a pair of portions (2a, 2b) opposite to each other and a hot-water soluble adhesive layer connecting the opposite portions of the label blank together, said hot-water soluble adhesive layer being soluble in contact with heated water of a temperature not lower than about 50°C.
45. 2. A generally tubular label as claimed in Claim 1, wherein said hot-water soluble adhesive layer (4) is soluble in contact with the heated water of a temperature within the range of 50° to 70°C.
50. 3. The generally tubular label as claimed in Claim 1, wherein the hot-water soluble adhesive layer (4) comprises a hot-water soluble adhesive material applied to one of the opposite portions (2a, 2b) of the label blank (2) so that the other of the opposite portions of the label blank can be con-

nected with such one of the opposite portions thereof through the adhesive material to complete a joint between the opposite portions.

4. A generally tubular label as claimed in Claim 1, wherein the hot-water soluble adhesive layer (4) comprises a length of hot-water soluble tape (3) bonded to the opposite portions (2a, 2b) of the label blank with the use of a bonding agent to complete a joint between the opposite portions. 5

5. A generally tubular label (1) adapted to be fitted around an article of manufacture, which label comprises a sheet-like label blank (2) having a pair of portions (2a, 2b) opposite to each other and an base-soluble adhesive layer (4) connecting the opposite portions of the label blank together, said base-soluble adhesive layer being soluble in contact with an aqueous solution of alkalis of predetermined temperature. 10

6. A generally tubular label as claimed in Claim 5 wherein the base-soluble adhesive layer (4) comprises an base-soluble adhesive material applied to one of the opposite portions (2a, 2b) of the label blank (2) so that the other of the opposite portions of the label blank can be connected with such one of the opposite portions thereof through the adhesive material to complete a joint between the opposite portions. 15

7. A generally tubular label as claimed in Claim 5, wherein the base-soluble adhesive layer (4) comprises a length of base-soluble tape (3) bonded to the opposite portions (2a, 2b) of the label blank with the use of any suitable bonding agent to complete a joint between the opposite portions. 20

25

30

35

40

45

50

55

FIG 1

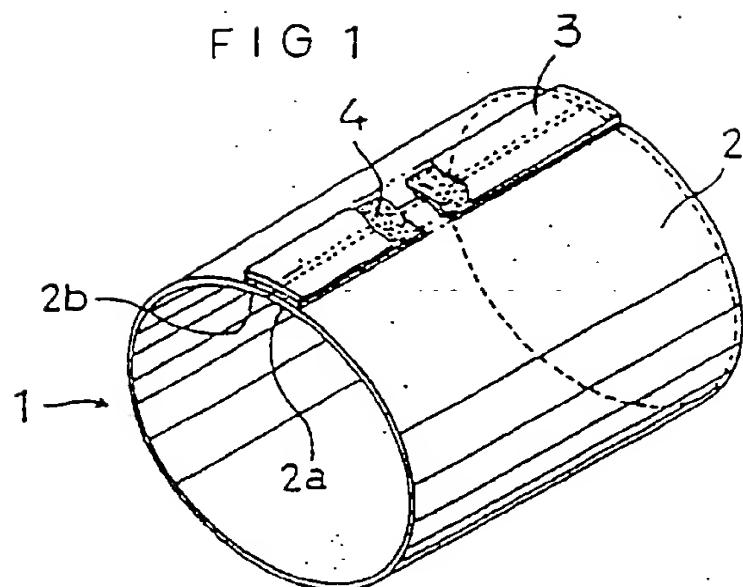


FIG 2

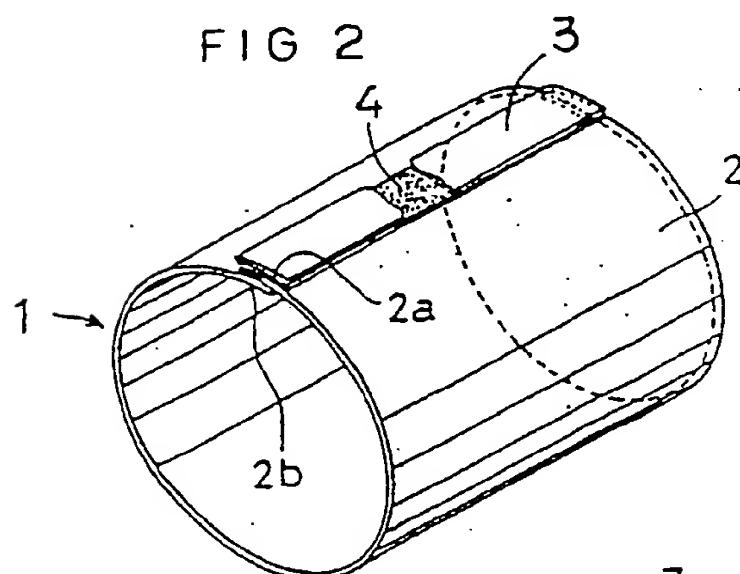


FIG 3

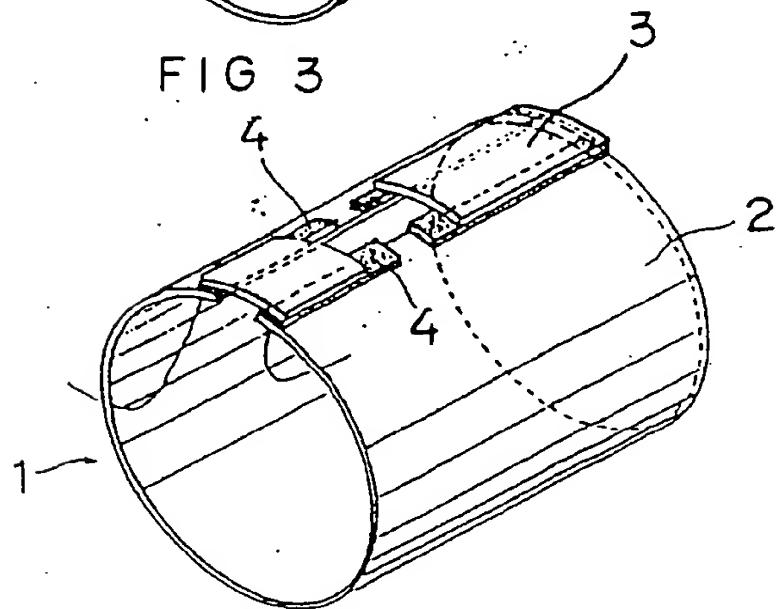


FIG 4

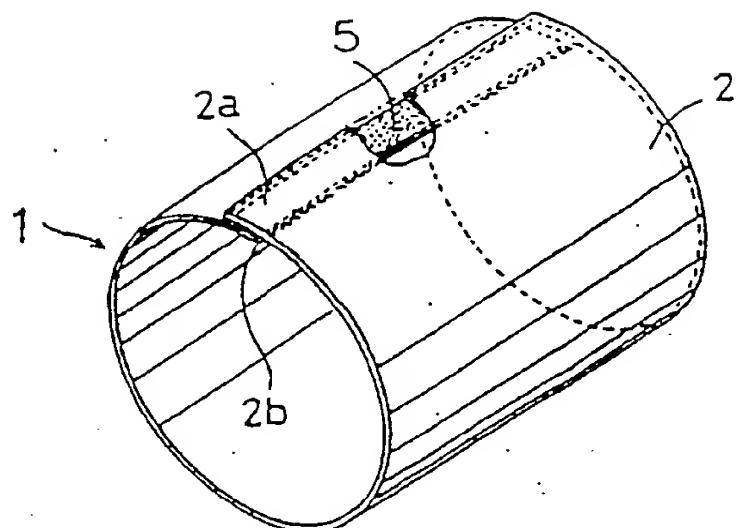


FIG 5

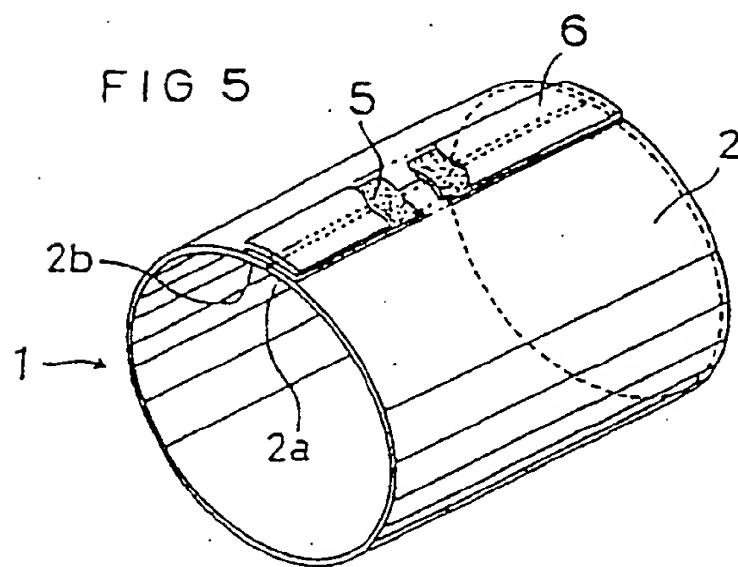
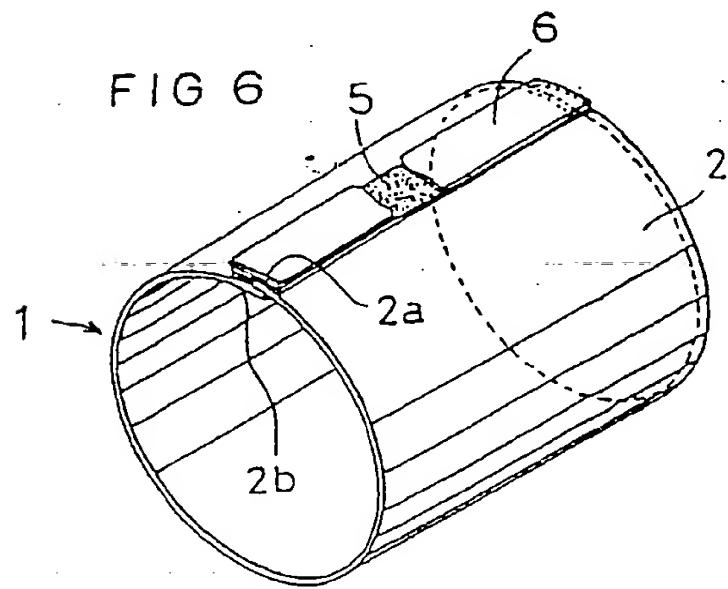


FIG 6



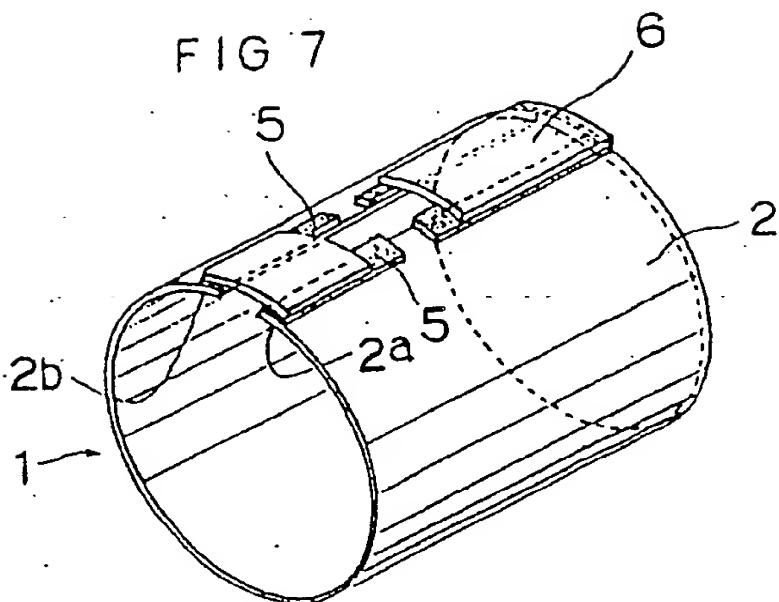


FIG 8

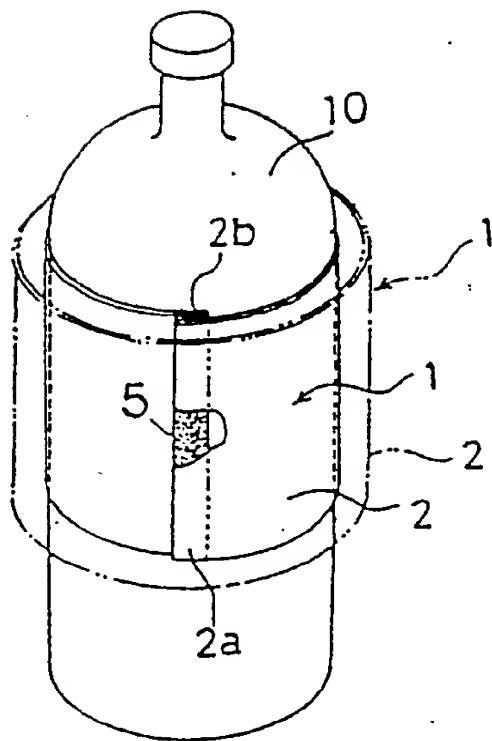
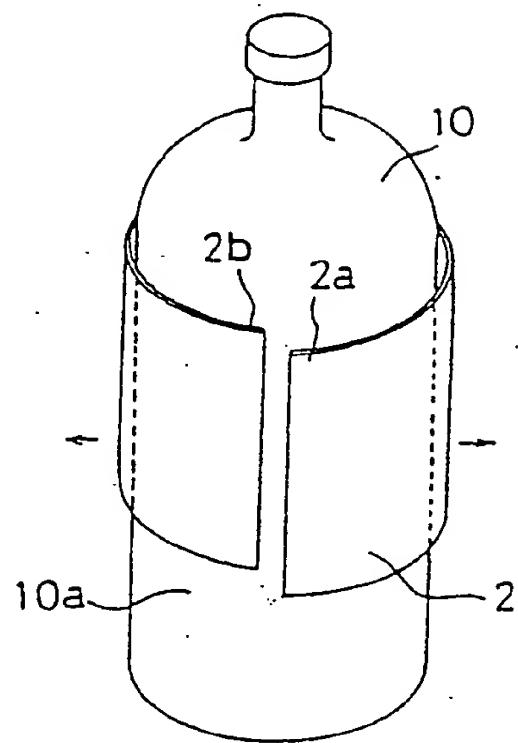


FIG 9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 10 0997

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	EP-A-0 145 383 (OWENS-ILLINOIS INC.) * Claims 5,7,9; page 7, lines 1-25; figures 1-6 *	1-2	G 09 F 3/02 G 09 F 3/10
A	---	3	
Y	EP-A-0 049 483 (HOECHST AG) * Claims 1-2,4,5,8-9; page 2, line 6 - page 3, line 22; page 8, lines 1-7; figure *	1-2	
A	FR-A-2 078 285 (LITTON BUSINESS SYSTEMS) * Page 3, lines 11-37; claims 1; figure *	5	
A	GB-A- 556 373 (WING-FOOT CORP.) * Claims 1-2; page 1, lines 51-100; figures 1-3 *	1	
A	US-A-4 055 441 (OWENS-ILLINOIS INC.) * Column 3, line 9 - column 4, line 25; claims 1,3,4 *	5	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	FR-A-2 574 969 (LUTRANA) * Claims 1-2; figure *	4,7	G 09 F B 65 D
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	26-04-1989	FRANSEN L.J.L.	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

THIS PAGE BLANK (USPTO)